**Kyle Michael Keane**

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**EDUCATION**

PhD, Physics University of California, Riverside 2012

MS, Physics University of California, Riverside 2009

BS, Physics (*Cum Laude*) California State University, Fullerton 2007

**WORK EXPERIENCE**

***Lecturer***Massachusetts Institute of Technology (MIT) June 2015 – present

Teach mathematical and computational methods in Department of Materials Science and Engineering. Teach Principles and Practice of Assistive Technology in Department of Electrical Engineering and Computer Science. Manage the Interactive Materials Education Laboratory with students learning to use technology to engage the public in materials science and engineering. Develop learning management system for combining core science curriculum with technical training in computer programming. Lead workshops and seminars on collaborative design, technology, and innovation.

***Technical Consultant***Wolfram Research – Communications and Strategy October 2015 – present

Manage and provide accessibility-related technical support. Feasibility testing and implementation of new software tools for automated online publishing and innovative content delivery.

***Research Scientist***Massachusetts Institute of Technology (MIT) January 2016 – January 2017

Led the development of a large-scale, atomistic kinetic Monte Carlo simulation for studying dewetting phenomena in thin metal films. Transferred the techniques of big data and data science to develop algorithms that modeled the interactions of atoms in a lattice. Used in-memory databases to calculate positions and energies of particles during dewetting process. Parallelized algorithm using Bayesian statistics in order to efficiently use graphical processing units (GPUs) to perform massively scalable physical simulations.

***Head of User Experience***Indico Data Solutions March 2015 – October 2015

Manage all facets of user experience: website design and usability, community engagement, and developer relations. Created wireframes, mockups, and prototypes to help define the strategic direction of the company's product. Facilitated and ran user research, interviews, and observational studies to better understand how to improve the company's existing and future product offerings. Designed and built the online documentation of the company's primary product, a suite of online RESTful API services for software developers. Established the use of online engagement metrics to track the effectiveness of the blog, website, social media, and other outreach activities to drive quality traffic to the company's product.

***Research Programmer***Wolfram Research – Educational Software Jan 2014 – March 2015

Designed and implemented new software features to help people learn college-level science problem solving. Consulted on data collection and analysis strategies to assess the effectiveness of educational products. Organized outreach and training activities for local educators to engage them in the effective use of technology for teaching science and computer programming at the primary, secondary, and post-secondary levels. Developed and delivered training materials at conferences, workshops, and online. Designed research projects and wrote grants to fund them.

***Research Programmer***Wolfram Research – Special Projects Nov 2012 – Dec 2013

Conceived and prototyped new product ideas to support emerging partnerships and determine the feasibility of large-scale development. Designed research projects and wrote grants to fund the improvement of access to technology and science for people with disabilities, including qualitative/quantitative data collection and analysis. Designed and programmed new features for helping blind people access Wolfram|Alpha, *CDF Player*, and *Mathematica*. Provided technical support to users with specialized business and usage challenges. Created and delivered presentations and training workshops at professional conferences, on the web, and in classrooms. Represented company at trade shows, conferences, and industry networking events.

***R&D Fellow***Wolfram Research – Special Projects July 2012 – Oct 2012

Performed a comprehensive review of the usability of the company’s current and in-development software products for persons with disabilities. Worked with technical leads to develop a tiered development plan to improve the usability of all products and guide future product releases. Prepared Section 508 Voluntary Product Accessibility Templates for all major products and oversaw their distribution on the corporate website. Created a functioning workaround for completely blind users to access *Mathematica*’s computational capabilities. Prototyped, implemented, and presented talks about creating accessible interactive content in Wolfram’s digital publishing format.

***Graduate Student Researcher***University of California, Riverside January 2009 – Aug 2012

Studied weak quantum measurements, uncollapsing, quantum error correction/detection, decoherence suppression, quantum state/process tomography, and their applications for quantum computation and communication. Developed, analyzed, and proposed experimentally procedures that were realizable and applicable to a wide range of emerging technologies and have now been verified in many physical systems, including the originally proposed superconducting qubit system. Activities: presented weekly updates on current progress and findings, assisted colleagues in developing their own research process, problem solving skills, and communication styles, prepared manuscripts for publication, presented research findings at professional conferences, and performed general organizational, training, and bureaucratic duties.

***Teaching Assistant***University of California, Riverside March 2010 - June 2010September 2007 - December 2008

Instructed laboratory classrooms, gave lectures, and led problem-solving sessions for the physics department. Structured classes for engaged student-initiated learning. Evaluated student performance and consulted with students regarding course progress. Created grading rubrics for laboratory notebooks. Developed and evaluated weekly quizzes. Held regular office hours. Guided discussions of relevant topics in physics. Courses: calculus-based classical mechanics lab, algebra-based electricity and magnetism lab, calculus-based electricity and magnetism lab, algebra-based classical mechanics lab, calculus-based modern physics discussion.

***Undergraduate Researcher***California State University, Fullerton August 2005 – August 2007

Performed high-precision measurements of differential cross-sections for electron impact on various targets. Manufactured and assembled a rotary table with highly controllable angular resolution for investigating different scattering geometries. Responsibilities: maintained, repaired, and fabricated laboratory equipment in a large experimental physics group. Troubleshooting, diagnosis, and remediation of issues with a wide array of technical instrumentation, basic lab equipment, hardware, and software.

***Physics Tutor***California State University, Fullerton September 2005 - June 2007

Assisted undergraduate major and non-major students in acquisition and comprehension of material for various physics classes. Helped students from various backgrounds to complete lecture and laboratory assignments. Created drills, study aids, and other interventions for students at all levels.

**PROFESSIONAL SKILLS**

**Programming (expert):** Mathematica, Wolfram Language

**Programming (competent):** Python, HTML/CSS/Javascript, PHP, Arduino, Processing

**Programming (familiar)**: Perl, Lua, Basic, Fortran, R, C++

**Accessibility:** Completed full Section 508 assessment of multi-platform scientific computing desktop application and publishing platform; performed comprehensive literature review of current accessibility standards for dynamic educational content; creating report on best practices for interactive digital educational content; hands-on experience testing software with assistive technologies; managed small team of accessibility representatives from multiple departments; maintained VPATs and provided technical solutions for blind users

**Teaching:** Classroom teaching experience in higher education math, science, and engineering courses; Developing and delivering curriculum to elementary school children about technology and computer programming

**Development**: Programmed software features to strengthen product offerings and usability of software in education; Designed data analysis template for electron scattering experiment; Quantum simulations (numerical and analytical work); Matrix differential equations; Manuscript preparation; Prototype creation; Public Speaking

**Procedural**: Designed data analysis template for electron scattering experiment; Quantum simulations (numerical and analytical work); Matrix differential equations; Manuscript preparation; Prototype creation; Public Speaking

**Laboratory**: Advanced Machining (Lathe, Mill, Tapping); Built precision rotary table and vibration resistant supports for an electron scattering spectrometer; Basic Electronics (Design, Soldering, Wiring)

**Organizational**: Planned, organized, and executed multiple workshops to teach elementary children about technology and computer programming; Worked as statistics instructor at a Summer camp for high school children; Started and organized a weekly graduate student colloquium; Organized and led a free weekly yoga class for fellow graduate students; Initiated and maintain a Hacker Night for interested coworkers

**RESEARCH EXPERIENCE AND INTERESTS**

***Effectiveness of Computer Programming to Bolster STEM Learning*** – PI: Kyle Keane, MIT and Wolfram Research. Project to learn whether specially designed computer programming exercises can improve learning outcomes in online STEM education

***Pedagogy of Interactive STEM Graphics*** – PI: Kyle Keane, Wolfram Research. Project and NSF proposal to study the effects of integrating interactive graphics into online STEM education

***Accessibility of Interactive STEM Graphics*** – PI: Kyle Keane, Wolfram Research. Designed, proposed, and received funding to develop a guide of best practices for providing an equivalent experience to blind people using interactive graphics within STEM disciplines. Recruited, hired, and trained an intern who performed a full documentation and literature review of relevant technologies

***Solid-state Dewetting of Thin Films*** – PI: Carl V. Thompson, MIT. Simulation of the atomistic dynamics of a thin metallic film sitting on a dewetting substrate

***Quantum Error Detection and Correction*** – PI: Dr. Alexander Korotkov, UCR. Analytically developed quantum error detection algorithms for current superconducting-qubit technology. Simulated experiment to verify feasibility.

***Weak Measurements*** – PI: Dr. Alexander Korotkov, UCR. Simulated past experiment to explain observed results. Developed a novel decoherence suppression algorithm involving weak measurement reversal

***Frustrated Magnetism*** – PI: Dr. Kirill Shtengel, UCR. Developed algorithm to find analytical solution to complex combinatorial problems. Optimized and implemented orthonormalization of large complex vector spaces

***Biophysics-Virus Formation*** – PI: Dr. Roya Zandi, UCR. Investigated numerical simulations of biophysical self-assembly at finite temperature

***Physics Education Research*** – PI: Dr. Michael Loverude, CSUF. Interpreted student answers on pedagogical-development quizzes and logged for statistical analysis

***Electron Scattering*** – PI: Dr. Murtadha Khakoo, CSUF. Designed and built a precision vibration-resistant rotary table for an electron scattering spectrometer. Designed and implemented a new data importation and analysis procedure

**PROFESSIONAL CONFERENCES**

***Annual MRS Meeting:*** 2015

***Scratch@MIT:*** 2014, 2016

***DIAGRAM Research Meeting:*** 2014

***ATIA Annual Meeting:*** 2014

***Joint Mathematics Meeting:*** 2014

***AAAS Annual Meeting:*** 2013, 2014

***Wolfram Technology Conference:*** 2012, 2013, 2015, 2016

***LearnLaunch:*** 2013 Boston, MA; 2014

***March Meeting of APS:*** 2010, 2011, 2012, 2015

***Coherence in Superconducting Qubits (Army Research Office)***: 2010

***Quantum Computation and Quantum Algorithms Program Review (IARPA)***: 2009

***DAMOP Meeting of the American Physical Society:*** 2007

**OUTREACH ACTIVITIES  
Workshops, Lectures, Seminars, Presentations, Panels, Posters**

***Summer School Instructor,*** “Visualization and Computational Science,”

July 2016, EPFL, Lausanne, Switzerland

***Summer School Instructor,*** “Visualization and Computational Science,”

July 2016, Imperial College, London, England

***Summer School Instructor,*** “Visualization and Computational Science,”

July 2016, Hermes Summer School, Windsor, England

***Guest Lecturer,*** “Computational Methods in Statistics,”

April 2016, Boston University, Boston, MA

***Honorarium Speaker,*** “CodeSeal: A Platform for research, education, and education research,”

March 2016, March Meeting of the American Physical Society, Baltimore, MD

***Workshop Leader,*** “A Complete Tour of Mathematica and the Wolfram Language for Research and Fun,”

January 2016, ten-session training series at MIT Independent Activities Period, Cambridge, MA

***Workshop Leader,*** “A Comprehensive Overview of Arduino Microcontrollers for Creative Exploration,”

January 2016, ten-day course at MIT Independent Activities Period, Cambridge, MA

***Conference Speaker,*** “Combining materials science curriculum with training in computer programming,”

December 2015, Annual Fall Meeting of Materials Research Society, Boston, MA

***Guest Lecturer,*** “Introduction to Web Accessibility,”

November 2015, MassArt, Boston, MA

***Conference Speaker,*** “Coding as an educational tool,”

October 2015, at the Wolfram Technology Conference, Champaign, IL

***Workshop Leader,*** “A Complete Tour of Mathematica and the Wolfram Language for Research and Fun,”

January 2015, ten-session training series at MIT Independent Activities Period, Cambridge, MA

***Webinar Speaker,*** “New Models for Creating Accessible Interactive Widgets for STEM Learning,”

August 7, 2014, on the DIAGRAM Center Researcher Series, Online

***Hackathon Mentor,*** “Wolfram Technologies for Travel and Education,”

July 17, 2014, at LearnLaunch Travel and Education hack-a-thon, Boston, MA

***Workshop Leader,*** “Game Programming 101 using Wolfram Language on the Raspberry Pi,”

June 28, 2014, at special event for Empow Studios, Lexington, MA

***Workshop Leader,*** “Using Wolfram Technologies for Teaching Robotics to Kids,”

June 28, 2014, at special event for Empow Studios, Lexington, MA

***Presenter,*** “Best Practices: Interactive Scientific Graphics on the Web,”

June 18, 2014, at the DIAGRAM Research Meeting, Warrenton, Virginia

***Panel Member,*** “What’s Next in Accessible STEM Learning Materials and Assessment,”

January 29, 2014, at the ATIA Annual Meeting, Orlando, Florida

***Panel Member,*** “Assistive Technologies for Math Students and Faculty with Disabilities,”

January 15, 2014, at the Joint Mathematics Meeting, Baltimore, Maryland

***Conference Speaker,*** “Standardizing Textual Descriptions of Interactive Graphics,”

October 30, 2013, at the EDUPUB Workshop, Boston, Massachusetts

***Webinar Speaker,*** “Physics Comes Alive with Wolfram Technologies,”

September 12, 2013, at the Wolfram Virtual Conference for Educators, Online

***Conference Speaker,*** “Creating Accessible Dynamic Content,”

October 17, 2012, at the Wolfram Technology Conference, Champaign, Illinois

***Colloquium Speaker***, “Beyond Traditional Quantum Measurement: A Game of Quantum Peek-a-Boo with a Purpose,”

November 5, 2011, at the CSUF Department of Physics Colloquium, Fullerton, California

***Presenter:*** Kyle Keane, Alexander N. Korotkov, “Currently realizable quantum error detection/correction algorithms for superconducting qubits” Bull. Amer. Phys. Soc. D29.14 (2011)

***Presenter:*** Kyle Keane, Alexander N. Korotkov, “Decoherence suppression of a solid state qubit by uncollapsing,” Bull. Amer. Phys. Soc. Z33.11 (2010)

***Presenter:*** Kyle Keane, Shayne Cairns, Colin Campbell, Murtadha A. Khakoo “Elastic Differential Cross sections for electron scattering from polyatomic molecules—an accurate, but novel application of the relative flow technique, using a moveable aperture source of gas atoms,” Bull. Amer. Phys. Soc. Q3.3 (2007)

***Poster:*** Kyle Keane, Alexander N. Korotkov, “Suppression of T1-type decoherence of phase qubits using uncollapsing and quantum error detection/correction,” presented April 26, 2010, at Coherence in Superconducting Qubits

***Poster:*** Alexander N. Korotkov, Kyle Keane, Ricardo Pinto, “Theoretical analysis of phase qubits,” presented August 19, 2009, at Quantum Computing and Quantum Algorithms Program Review

***Poster:*** Brent R. Yates, Kyle Keane, Murtadha A. Khakoo, “Low energy impact ionization of neon and xenon,” Bull. Amer. Phys. Soc. Y1.38 (2009)

***Commencement Speaker***, “Look to this Day”, June 15, 2007, at the CSUF College of Natural Sciences and Mathematics commencement ceremony, Fullerton, California.

***Poster:*** Murtadha A. Khakoo, Kyle Keane, Colin Campbell, Shayne Cairns, “An accurate, but novel application of the relative flow technique, using a moveable aperture source of gas atoms to measure elastic electron scattering differential cross sections,” Bull. Amer. Phys. Soc. R1.99 (2007)

**PUBLICATIONS**

Kyle Keane, Interactive Scientific Graphics: Recommended Practices for Verbal Description, Report retrieved from   
http://diagramcenter.org/wp-content/uploads/2014/06/Interactive\_Scientific\_Graphics\_Submission23june2014.docx

Kyle Keane, Quantum State Protection and Transfer Using Superconducting Qubits, Doctoral Dissertation retrieved from http://escholarship.org/uc/item/8nq7q2hn

Kyle Keane and Alexander Korotkov, “Simplified quantum error detection and correction for superconducting qubits,” Phys. Rev. A **86**, 012333 (2012)

Alexander N. Korotkov and Kyle Keane, “Decoherence suppression by quantum measurement reversal,” Phys. Rev. A **81**, 040103(R) (2010)

B R Yates, K Keane, and M A Khakoo, “Near-threshold electron impact doubly differential cross sections for the ionization of neon and xenon,” J. Phys. B: At. Mol. Opt. Phys. **42**, 095206 (2009)

M A Khakoo , J Blumer, K Keane, C Campbell, H Silva, M C A Lopes, C Winstead, V McKoy, R F da Costa, L G Ferreira, M A P Lima, and M H F Bettega, “Low-energy electron scattering from methanol and ethanol,” Phys. Rev. A **77**, 042705 (2008)

M A Khakoo, K Keane, C Campbell, N Guzman, and K Hazlett, “Low energy elastic electron scattering from ethylene,” J. Phys. B: At. Mol. Opt. Phys. **40**, 3601 (2007)

**COMMUNITY SERVICE**

***Advisor*** ATHack - MIT 2016 – present

***Volunteer*** Foundation Fighting Blindness 2008 – present

VIStars 2013 – 2015

Blindness Support Services 2010

Braille Institute 2006

Salvation Army 2006

Goodwill 2006

***Yoga Instructor*** UC Riverside, Wellness Center 2010 - 2012

***Facilitator*** UC Riverside, Services for Student with Disabilities 2010 - 2012

***Musician*** Various Community Centers 2010 - 2012

***Physics Club Officer*** California State University, Fullerton 2006 - 2007

***Camp counselor*** Foundation for the Junior Blind 2002

**HONORS AND AWARDS**

***Molly******Adams******Scholarship***, University of California, Riverside (2009)

***Chancellor’s******Distinguished******Fellowship***, University of California, Riverside (2007)

***Norman Nitzburg Award in Experimental Physics***, California State University, Fullerton (2007)

***Wolfram Award in Computational Science***, California State University, Fullerton (2007)

***Outstanding Scholarship Award***, California State University, Fullerton (2007)

***Dan Black Scholarship***, California State University, Fullerton (2007)

***Norman Nitzburg Award in Experimental Physics***, California State University, Fullerton (2006)

***Dan Black Scholarship***, California State University, Fullerton (2006)

***Kellogg Scholar***, California Polytechnic University, Pomona (2002)

***California Governor’s Scholarshare Award***, Ruben S. Ayala High School (2002)